EDGEWOOD
RESEARCH, DEVELOPMENT & ENGINEERING CENTER
U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE COMMAND

ERDEC-SP-046

COMPENDIUM OF LICENSABLE PATENTS ISSUED TO THE EDGEWOOD RESEARCH, DEVELOPMENT AND ENGINEERING CENTER AND PREVIOUS ACTIVITIES

Stella Y. Chung

ADVANCED SYSTEMS CONCEPTS DIRECTORATE

January 1997

Aberdeen Proving Ground, MD 21010-5423

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The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorizing documents.

DEPARTMENT OF THE ARMY
U.S. Army Edgewood Research, Development and Engineering Center
Aberdeen Proving Ground, Maryland 21010-5423

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Sandra J. Johnson
SANDRA J. JOHNSON
Chief, Technical Releases Office

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This report documents patents issued to the Edgewood Research, Development and Engineering Center and its preceding activities. The majority of these patents are available for licensing from the center for persuing commercialization opportunities.

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PREFACE

The work described in this report was authorized under Project No. 10665801MM55, Management/Administrative Support. This work was started in August 1996 and completed in January 1997.

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COMPENDIUM OF LICENSABLE PATENTS
ISSUED TO THE EDGEWOOD RESEARCH,
DEVELOPMENT AND ENGINEERING CENTER
AND PREVIOUS ACTIVITIES

An Introduction to the Edgewood Research, Development and Engineering Center

The Edgewood Research, Development and Engineering (RDE) Center was established in October 1994, along with the establishment of the U.S. Army Chemical and Biological Defense Command. Formerly known as the Chemical RDE Center, Edgewood is the Defense Department's principal research and development facility for chemical and biological technology, engineering and service. Our current business areas include reconnaissance, detection and identification; individual and collective protection; decontamination and remediation; and smoke and obscuration. Much of the work patented in these business areas has the potential for application outside of the military realm. Those patents available for licensing are included in this compendium. Predecessor activities of the Edgewood Center were also responsible for the design and development of lethal incapacitant agents and delivery systems. All work in this business area ceased with the United States' open declaration and commitment to a world-wide ban on the production, stockpiling and use of chemical warfare agents. Selected patents relative to this mission area are included here as many may have potential application other than the intended military use.

Current scientific, technical and engineering endeavors fall into the following business areas and technologies:

Reconnaissance, Detection and Identification -- Development and integration of sensor systems for the detection, identification and warning of all known and future chemical and biological agents, including toxins. Technologies applicable to this business area include: aerosol/vapor sampling, biodetection, chemical microsensors, frequency agile CO_2 lasers, ion mobility spectroscopy, multi agent detection, noninvasive verification, radiation detection and analysis, remote infrared detection, and standoff detection.

Individual and Collective Protection -- Design and development of eye/respiratory protection and protection of vehicles, vans and shelters against chemical and biological contaminants. Applicable technologies include: air filtration, inhalation air distribution, reactive adsorbents, catalytic oxidation, engineered adsorbents, speech amplification, membrane separation and filtration, and regenerative filtration.

Decontamination and Remediation -- Development of decontaminants and decontamination systems for chemical and biological contaminants. Absorbents, catalysis, composite materials, membranes, nonaqueous technologies, toxicology, and reactive solutions are being utilized in this business area.

Smoke and Obscuration -- Development of obscurant and delivery systems to counter the threat from surveillance, target acquisition, and guidance systems, incorporating technologies such as aerosol generation and dissemination, enhanced reactive materials, modeling, pharmacokinetics, energy neutralization, and chemical dispersion and dissemination signal processing.

Most Recently Issued Patents -- These are the patents that were issued since Oct 1996.

Patent Licensing Agreements

Licensing is one of several mechanisms used by Federal Laboratories to transfer technology to the private sector. There are two types of licensing agreements that can be entered into -- exclusive and non-exclusive. Under the terms of an exclusive license agreement, the licensed party has exclusive rights to the patent for the duration of the agreement. In a non-exclusive licensing agreement, the patent holder may license the technology to more than one party simultaneously. The licensee may also be given the right to sub-license the technology. A non-federal party has an option to choose an exclusive license for a pre-negotiated field of use for any invention made during a Cooperative Research and Development Agreement (CRDA).

Royalties are paid to the inventors as specified in the Licensing Agreement. Under the present guidelines, Federal employees can receive up to a twenty percent share of these royalties, up to $150,000 per annum. The balance goes to the Federal activity where the technology was developed and patented. Activities receiving royalties are required to disburse them in one of several ways: payment of expenses incurred with licensing inventions; reward of scientific, technical or engineering accomplishments, to include recognition of inventors of sensitive or classified technology; advancement of scientific exchange among Government-operated laboratories, education and activities relative to the mission and to the promotion of licensing and technology transfer; conducting R&D consistent with the mission of the laboratory; or hiring temporary personnel to carry out work related to the CRDA without regarding to full time equivalent restrictions.

The Edgewood Center presently has four patent licensing agreements with industry. Additional licensing agreements are being negotiated at this time. The current agreements are:

Patent 4324858, Stabilization of Cholinesterase, Detector Kit Using Stabilized Cholinesterase, and Methods of Making and Using the Same

Non-exclusively licensed to *Environmental Health & Safety Products, Inc.* Technology is being adapted to measure potential exposures to selected pesticides.

Patent 4954320, Reactive Bed Plasma Air Purification

Exclusively licensed to *Battelle's Pacific Northwest Laboratory*. Battelle is investigating the potential of this technology in air purification.

Patents 4248342, 4325309, 4326468 and 4347796, all entitled Blast Suppressive Shielding

Exclusively licensed to Alliant Techsystems Inc, formerly known as Shielding Technologies, Inc. This technology is being applied to protection from hazardous materials during a variety of operation.

Patent 5059349; 5059352; and 5076965 entitled Method of Measuring the Efficiency of Gas Mask Filters Using Mono-dispersed Aerosols; Method for the Generation of Mono-dispersed Aerosols for Filter Testing; and Method of generating Mono-dispersed Aerosols for Non-Destructive Gas Mask Filter Testing; respectively

Non-exclusively licensed to Abbott Laboratory for conducting filter testing on clean room filters located at plants owned or operated by licensee.

Reconnaissance, Detection and Identification

On-the-Move Surface Sampling Head for a Mass Spectrometer

Inventor David Sickenberger, Emory Sarver

Abstract An on-the-move surface sampling head utilizes a silicone membrane with an internal meter in conjunction with a mass spectrometer analyze and a modified transfer line having a quick-connect electrical-pneumatic connector to detect chemical contaminated areas.

Patent Number 5517026 Date of Issue 05/14/96
Application Number 376169 Date Filed 01/20/95

Tank Alerting System

Inventor Paul G. Schabdach, Irving F. Barditch

Abstract A low cost warning system for armored vehicles which uses multiple sensors containing detectors for IR and millimeter wave signals emanated by attacking missiles and/or projectiles to allow the launching of screening grenades. The sensors telemeter their coded signals to a receiver inside the vehicle which process the coded signals to direct the exercise of an active screening defense.

Patent Number 5229540 Date of Issue 07/20/93
Application Number 888995 Date Filed 05/26/92

4,4'-Dithiodianil

Inventor Thaddeus J. Novak

Abstract Novel 4,4'-dithiodianil compounds are prepared by reacting 4,4'-dithiodianiline with an aromatic or pyridine aldehyde, such as 4-nitrobenzaldehyde. The novel dithiodianil compounds can be employed for detecting thiol compounds. They react with thiols to yield reaction products which possess a different color from the novel dithiodianil compound itself. The color change obtained in this manner with the novel compounds in many cases is stronger than that obtained with Ellman's reagent frequently employed for detecting thiols.

Patent Number 4414414 Date of Issue 11/08/83

Application Number 301507 Date Filed 09/14/81

Aerosol, Vapor and Liquid Chemical Agent Detector with Extending Sensor Plate

Inventor Robert C. Lyons

Abstract A chemical agent detector having a pair of vapor/aerosol chemical agent detector cells mounted with a lithium battery in a detection cell module. A liquid agent detector having a hinged plate is attached to an electronic system which includes a signal processor that energizes a plurality of warning LED's and a horn in response to energization of selected agent detectors. An air pump is mounted on the housing for the electronics to force air across the detection cells. The detection cell module is connected to the housing for the electronics. A battery compartment is connected to the detection cell module and includes means for permitting an external power source to be connected thereto.

Patent Number	4933669	Date of Issue	06/12/90
Application Number	392865	Date Filed	08/11/89

Detection of Sulfur Mustards Using Spectrofluorometry

Inventors Thaddeus Novak and Paul M. Davis

Abstract Fluorescence properties of the product of the reaction of the 2-naphthalene-thiolate ion and 2-chloroethylethylsulfide or bis(2-chloroethyl) sulfide are described. The fluoresence of the latter reaction is used as the basis of a new detection method for 2-chloro-ethylethylsulfide. The detection method is capable of detecting 2-chloroethylethylsulfide at levels down to 0.2 micrograms per milliliter.

Patent Number	5032380	Date of Issue	07/16/91
Application Number	488180	Date Filed	03/05/90

Flow Compensated Gas Comparison Probe

Inventors Hugh R. Carlon and Bernard V. Gerber

Abstract A gas comparison probe contains first and second sensor elements isolated from each other. Air is drawn across a surface to be monitored and directed onto the first sensor element. Air is drawn from a location spaced away from the surface to be monitored and

directed onto the second sensor element. A flow constrictor in the air flow path to one of the sensor elements under known conditions before attempting to monitor air flow which may contain a gas to be detected.

Patent Number	4343177	Date of Issue	08/10/82
Application Number	204744	Date Filed	11/07/80

Method and Instrument for Mass Analyzing Samples With a Quistor

Inventors Jochen Franzen, Reemt-Holger Gabling, Gerhard Heinin and Gerhard Weiss

Abstract A method for the measurement of mass spectra by three dimensional quadruple fields (Quistors) is presented, in which the ions are mass-to-charge selectively ejected by a selected nonlinear resonance effect in an inharmonic quistor. In order to enhance scan speed and mass resolution, the ejection of a single kind of ions can be confined to a very small time interval, either by the generation of ions within a small volume outside the field center, or by an excitation of the secular amplitudes by an additional RF voltage across the end electrodes, shortly before the ions encounter the sum resonance condition. An instrument for this method is described.

Patent Number	4975577	Date of Issue	10/04/90
Application Number	459156	Date Filed	12/29/89

Method for Detection of Microorganisms

Inventor Sheila J. Wood

Abstract A microorganism detection system provides initial warning, confirmation of identity, and recognition of pathogenic factors in microorganisms from environmental samples. The method and apparatus of the invention uses different sized antibody coated microspheres which react with unknown antigens, are sized by electronic volume sizing, and are sorted by size. The sized particles are quantitated in addition to being sized. The microsphere sizes indicate the presence of specific microorganism groups. The samples can be further analyzed using fluorescent microspheres which agglutinate with the sized microspheres. The presence of specific microorganisms is indicated by a change in the fluorescence of the sample.

Patent Number	5290707	Date of Issue	03/01/94

Application Number 797754 Date Filed 11/25/91

Method of Mass Analyzing a Sample by Use of a Quistor

Inventors Jochen Franzen, Reemt-Holger Gabling, Gerhard Heinin and Gerhard Weiss

Abstract In a quadruple ion store (quistor), a sample is analyzed by increasing the amplitude of the harmonic, or "secular", oscillations of selected stably trapped ions so that they leave the trapping field. In a preferred embodiment, deviations from the ideal electrode geometry are incorporated into the quistor to produce resonance phenomena between the R and Z secular oscillations, thereby increasing the amplitude of oscillations in the Z direction.

Patent Number 4882484 Date of Issue 11/21/89
Application Number 265108 Date Filed 10/31/88

Photolysis of Lactones

Inventors David N. Kramer and Thomas N. Oeltmann

Abstract The photochemical decarbonylation of Lactones and the method of detecting micro quantities of A,A-diarylglycolate esters comprising an acidic reaction mixture containing the esters and naphthols producing a lactone, decarbonylating the lactone by irradiation and forming a colored solution.

Patent Number 4676880 Date of Issue 06/30/87
Application Number 830221 Date Filed 05/29/69

Short Scan Passive Infrared Remote Sensor

Inventors Robert T. Kroutil, John T. Ditillo, William R. Loerop, Dennis M. Davis, Lynn D. Hoffland and Michael S. Desha

Abstract A short scan passive infrared remote sensor for detecting a target chemical species, located some distance from the center burst, includes a telescope for targeting a remote gas, a beam splitter means for splitting a beam from the target gas and sending one portion along a first path to an infrared detector. The second path is variable by providing a moving mirror a first distance away from the beam splitter which is 0.5 mm farther away from the beam splitter than the fixed mirror. By this arrangement, a mirror movement of only 0.5 mm is required to obtain an equivalent of 8 cm -1 spectral information for processing with

time domain digital filters. The information from the infrared detector is converted from analog to digital and fed to a digital signal processor. The resulting interferogram is then filtered by a microprocessor using a fir linear digital filter.

Patent Number	5061854	Date of Issue	10/29/91
Application Number	513536	Date Filed	04/10/90

Stabilization of Cholinesterase, Detector Kit Using Stabilized Cholinesterase, and Methods of Making and Using the Same

Inventors Louis H. Goodson and Alan Goodman

Abstract The stability of cholinesterase (particularly a cholinesterase solution impregnated into a porous material and air-dried) can be improved by: (a) buffering the cholinesterase solution with a zwitterionic buffer, e.g., a buffer having a sulfonic acid group and a protonable amine group, and, preferably, (b) further drying the impregnated, air-dried porous material under a high vacuum (e.g., 0.01 mm hG or less) at normal ambient temperatures. The most useful porous materials are sheet-like in nature; that is they have only two major surfaces. An impregnated, sheet like material of this invention can be used in a cholinesterase inhibitor detector kit. A typical kit of this type provides a simple means for detecting, inter alia, environ-mental cholinesterase-inhibiting pollutant, e.g., organophosphorus pesticides and nerve agents.

Patent Number	4324858	Date of Issue	04/13/82
Application Number	160027	Date Filed	06/16/80

Thermoluminescence Sensor for the Remote Detection of Chemical Agents and Their Simulants

Inventor Arthur H. Carrieri

Abstract A system for remotely detecting liquid contaminants on surfaces, including chemical agents and their Simulants is presented. The system includes a Fourier Transform Infrared Spectroradiometer aligned to optionally develop gray body photoluminescence spectra from the generation of a plurality of interferograms co-added to provide a favorable signal to noise ratio for use with and thereafter transforming the co-added interferograms. A laser is used for surface irradiating a substrate potentially having the chemical agents to heat the substrate. A shutter controls the laser to receive and record photoluminescence emissions from the heated substrate, and generate a plurality of interferograms co-added to provide a favorable signal to noise ratio for use with the Fourier Transform Infrared Spectroradiometer.

The co-added interferograms are used to generate molecular absorption resonant peaks which are mathematically processed in the Fourier Transform Infrared Spectroradiometer. The acquired data is processed to match the spectrum of known chemical agent and the measured difference emissions spectrum during irradiation. If a match exists, the presence of chemical agents is confirmed. A digital filter may be used to extract the chemical agent emission band which are distinct from the emission bands of the substrate sought by the detection system.

Patent Number	5241179	Date of Issue	08/31/93
Application Number	976854	Date Filed	11/16/92

Use of Sulfoxides for Testing Ionization Detector System

Inventors Joseph Epstein, John A. Parsons and Frank Block

Abstract A method of simulating a positive response by volatile organophosphorus esters to an ionization detector system which comprises forwarding to the ionization detector system a gaseous stream comprising water vapor and a di(lower alkyl) sulfoxide or a cyclic sulfoxide represented by the formula I: wherein R is hydrogen or a lower alkyl group, in an amount sufficient to elicit a positive response by the ionization detector system.

Patent Number	4840911	Date of Issue	06/20/89
Application Number	55811	Date Filed	05/28/87

Viable Micro Organism Detection by Induced Fluorescence

Inventors A. Peter Snyder, David B. Greenburg and Pasquale V. Scarpino

Abstract The present invention concerns a spectrometric technique to determine micro-organism detection and identification by taking advantage of the inherent extracellular enzymes present in living organisms, as opposed to dead, non-enzyme producing organisms. These enzymes are harnessed in the in vivo reactions with a non-fluorescent dye containing a select organic functional group that is known to be cleaved or hydrolyzed by the certain enzyme. The dye is tailored such that one of the products fluoresces, so that by employing a conventional spectrofluorimeter, the rate of fluorescence can be determined. By subjecting a plurality of samples having different cellular concentrations of viable microorganisms to the same non-fluorescent dye, or by subjecting the same bacterial sample to a number of different non-fluorescent dyes, a pattern of fluorescent rates emerge. By employing the pattern recognition set to standard microorganism fluorescent response curves, microorganism detection and identification can be determined. Thus, the present invention concerns a process for determining microorganism detection, identification and concentration.

Patent Number	5089395	Date of Issue	02/18/92
Application Number	222258	Date Filed	06/21/88

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Individual and Collective Protection

Filter for a Respiratory Device

Inventor John A. Scavnicky, Corey M. Grove

Abstract Disclosed is a filer for a reduced threat chemical/biological protective respiratory device which includes a housing having an air intake orifice and an air exit orifice and which encloses a filtering element which includes a plurality of bonded spherical carbon beads arranged in a open cell type matrix. The filtering element also includes an aerosol and particulate filtering element which is a plurality of electrostatically charged polypropylene fibers.

Patent Number	5478377	Date of Issue	12/26/95
Application Number	281802	Date Filed	07/22/94

Gas Mask Filters Test Apparatus Using a Breathing Pump

Inventors John T. James, Leonard C. Buettner and James A. Genovese

Abstract A method and apparatus for testing a gas mask filter element comprising, sample supply means for supplying a test sample, a filter element box for containing a gas mask filter element, said element box having a sample inlet connected to said sample means for supplying a test sample to a filter element in the element box to form an effluent in the box, and an effluent outlet for discharging the effluent from the box. An inhalation chamber defining a space and having an effluent inlet connected to said space, said inhalation chamber having a chamber outlet for discharging effluent from said space. At least one plethysmographic box connected to said inhalation chamber for receiving a test animal can pass into said space through which the head of a test animal can pass into said inhalation chamber space. Respiration response means connected to said plethysmographic box for measuring a respiratory response of a test animal therein, and a breathing pump connected to said chamber outlet for drawing effluent from said inhalation chamber space in a manner which simulates human respiration.

Patent Number	4622852	Date of Issue	11/18/86
Application Number	772989	Date Filed	09/06/85

Method for Measuring and Testing the Efficiency of Gas Mask Filters Using Monodispersed Aerosols

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved method of testing a particulate filter. This is accomplished by passing a salt nuclei coated with isopropyl isostearate.

Patent Number	5094779	Date of Issue	03/10/92
Application Number	636165	Date Filed	12/31/90

Method for Measuring the Efficiency of Gas Mask Filters

Inventors Mark A. Guelta and Hugh R. Carlon

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol is generated by nebulization of the mixture prior to penetration of the filter. The aerosol mixture being in %, by volume, of about: 70-76 % isostearic acid, 6-7 % isopalmitic acid, 7-11 % myristic acid, and 4-5 % palmitic acid.

Patent Number	5059348	Date of Issue	10/22/91
Application Number	636161	Date Filed	12/31/90

Method of Generating Mono Dispersed Aerosols for Non-Destructive Gas Mask Filter Testing

Inventors Mark Guelta and Hugh R. Carlon

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol is generated by nebulization of the mixture prior to penetration of the filter. The aerosol mixture solely being a polyolefin having a content of chain hydrocarbon in %, by volume, of about: 0.6% to carbon chain length 20, 82.1% to carbon chain length 30, 16.0% to carbon chain length 40, 1.0% to carbon chain length 50, and 2.0% to carbon chain length 60.

Patent Number	5076965	Date of Issue	12/31/91
Application Number	636163	Date Filed	12/31/90

Method of Measuring the Efficiency of Gas Mask Filters Using Monodispersed Aerosols

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol mixture solely being a poly-alpha olefin having a content of chain lengths in % by volume of about: 1.6% - 20 carbon atoms, chain length; 82.1% - 30 carbon atoms, chain length; 16.0% - 40 carbon atoms, chain length; 1.0% - 50 carbon atoms, chain length; and 2.0% - 60 carbon atoms, chain length.

Patent Number	5059349	Date of Issue	10/22/91
Application Number	636162	Date Filed	12/31/90

Method of Measuring the Efficiency of Gas Mask Filters Using Non-Toxic Mono Dispersed Aerosols

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol mixture solely contains in percentage, by volume, of about: 60-66% isostearic acid, 13-17% isoleic acid, 1-3% isopalmitic acid, 8-10% stearic acid, and 6-12% oleic acid.

Patent Number	5087389	Date of Issue	02/11/92
Application Number	636166	Date Filed	12/31/90

Method of Measuring the Efficiency of Gas Mask Filters, Respirators and Other Personnel Protective Equipment

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved method of testing a particulate filter. This is accomplished by passing a salt nuclei coated with a mixture containing isostearic acid, isopalmatic acid, myristic acid and palmitic acid through the filter to be tested.

Patent Number	5080829	Date of Issue	01/14/92
Application Number	625723	Date Filed	12/07/90

Method of Testing the Efficiency of Gas Mask Filters Using Monodispersed Aerosols

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved method of testing a particulate filter. This is accomplished by passing the following ester mixture on salt nuclei consisting essentially in percentage, by volume, of about: 58% methyl oleate, 24% methyl stearate, 14% methyl linoleate, and 4% methyl palmitate.

Patent Number	5059351	Date of Issue	10/22/91
Application Number	636164	Date Filed	12/31/90

Method of Testing the Efficiency of Gas Mask Filters Using Monodispersed Aerosols

Inventors Hugh Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol mixture solely containing the following in percentage, by volume, of about: 71% oleic acid, 8% palmitoleic acid, 7% linoleic acid, 4% palmitic acid, 3% myristic acid, 3% myristoleic acid, 1.5% linolenic acid, 1.5% margaric acid, and 1% stearic acid.

Patent Number	5059353	Date of Issue	10/22/91
Application Number	6361627	Date Filed	12/31/90

Method of Testing the Efficiency of Gas Mask Filters Using Poly-Alpha Olefin Aerosol Mixtures

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved process of passing an aerosol mixture through a filter. The aerosol mixture solely being a poly alpha olefin having a content of hydrocarbon by % volume of: 30.9% chain length 30, 42.8% chain length 40, 20.4% chain length 50, 4.8% chain length 60, and 1.1% chain length 70.

Patent Number	5059350	Date of Issue	10/22/91
Application Number	636160	Date Filed	12/31/90

Methods for the Generation of Monodispersed Aerosols for Filter Testing

Inventors Hugh R. Carlon, Mark A. Guelta and Bernard V. Gerber

Abstract An improved method of testing a particulate filter. This is accomplished by passing a salt nucleus coated with a composition containing a poly-alpha olefin having chain length in %, by volume, of about 97-99% of 20 carbon atoms, and about 3% of 30 carbon atoms.

Patent Number	5059352	Date of Issue	10/22/91
Application Number	636159	Date Filed	12/31/90

Multilayer Protective Gas Mask

Inventors Albert N. Tardiff, Jr. and Corey M. Grove

Abstract A gas mask having a facepiece comprised of three separate transparent layers secured around their peripheries in a detachable manner, the inner layer being made of soft material, the middle layer being made of material that flexibly retains its form, and the outer layer being made of material for protection against liquid agents. An eye outsert is formed from the middle layer over the area around the eyes of a wearer, and a nose cone is formed from the middle layer so as to provide space about the nose and mouth. Inhaled air is drawn through channels formed in the middle layer that extend from the periphery of the facepiece to the outsert, inhaled air passes through a channel formed in the middle layer to the nose cone. A passageway is provided for exhaled air to pass from the nose cone. Prescription lenses for the wearer are integrally formed in a member that can be snapped into the eye outsert. Seals are provided around the periphery of the facepiece and around the nose cone by channels in the middle layers that are filled with a gel and/or compressed air. A hood of treated elastic material fits over the head of the wearer so as to draw the seals into contact with the wearer's skin. The hood surrounds the neck and has a flap that overlies the chest of the wearer, and an air pump and decontamination canister coupled to the channels for inhaled air are mounted in the flap. Electronic controls are also mounted on a flap for controlling the pump so as to maintain a constant pressure between inhaled and exhaled air.

Patent Number	5181506	Date of Issue	01/26/93
Application Number	695142	Date Filed	05/02/91

Protective Hood Jacket Resistant to Toxic Environments

Inventors John G. Schriver, William L. Riffel, John D. Scheible and Alan E. George

Abstract A protective hood jacket adapted to be worn in combination with a protective suit in toxic environments comprises a hood jacket formed of heat sealable material forming a garment that is hip length and short sleeved. There is a large hump in the rear to accommodate the air cylinder of a self-contained breathing apparatus and to avoid forward bending. There is a combination closure in the back of the jacket consisting of a metal zipper and a chloropel zip-lock closure for donning/doffing an air bottle replacement. Vapor leakage is mechanically reduced by two types of seals. The first type encompasses the garment peripheries at the waist and sleeve ends and these seals incorporate cable draw strings and B-lock fasteners allowing for adjustment. The second type constitute internal collars, spaced above the end of the sleeves and waist and around the neck which include elastic webbing providing self-adjustability to fit small, medium, and large size personnel. The elastic collar inside the hood, proximate the neck area, is designed to further reduce vapor infiltration to the head area and includes a frontal Velcro closure which fastens around the BA mask inlet air tube.

Patent Number	4864654	Date of Issue	09/12/89
Application Number	191081	Date Filed	05/06/88

Reactive Bed Plasma Air Purification

Inventors Joseph G. Birmingham and Robert R. Moore

Abstract The reactive bed plasma is a novel air purification and material processing device which may efficiently treat both toxic chemicals and hazardous aerosols. The reactive bed plasma device embodies an active alternating current discharge plasma permeating a dielectric packed bed. Advantages of this device include an increased power efficiency by the elimination of dielectric barriers (characteristic of ozonizer devices); a selectively increased residence time of contaminants in the active plasma zones through interaction with packing material (analogous to chromatographic separations); also a reduced size and power consumption while maintaining high processing efficiency. Further advantages include greatly increased operating lifetime without failure due to electrical arcing (problematic with ozonizers) or poising of the packing surfaces (problematic with adsorbents and catalysts); an achievement of a high processing efficiency at low temperature; a control over plasma air by-product formation; and the promotion of chemical and physical reactions simultaneously in a single device heretofore requiring several different devices (promoting photoionization, catalytic oxidation, plasma-induced decomposition, combustion, electrostatic precipitation, or plasma etching process).

Patent Number	4954320	Date of Issue	09/04/90
Application Number	401199	Date Filed	08/31/89

Respiratory Test Circuits and Methods

Inventor Paul V. Pullen

Abstract A respiration test method for providing accurate test signals which may be used to measure the duration of a subject's inhalation and exhalation period, and electronic timing circuits for performing such methods. The circuit includes a clock and two flow detectors. One flow detector senses inhalation while the other senses exhalation of a subject. A logic circuit selectively transmits clock pulses from the clock to an inspiratory clock output and an expiratory clock output. The flow detectors generate two-state inhalation and exhalation signals that are at a first state during the duration of the respective inhalation and exhalation periods plus a small timing-out period. The logic circuit, which is connected to clock and the flow detectors, transmits the clock pulses from the clock to the inspiratory clock output when the inhalation signal is at the first state, and to the expiratory clock output when the exhalation signal is a the first state. The logic circuit also includes an overlap detector that generates an overlap pulse when the inhalation signal and the exhalation signals are simultaneously in the first state, and a gate that selectively blocks the transmission of the clock pulses to said inspiratory and expiratory clock outputs in responsive to the overlap pulse.

Patent Number	5477861	Date of Issue	12/26/95
Application Number	180491	Date Filed	01/07/94

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Decontamination and Remediation

Biodegradation of 1,4-Dibenz and Related Compounds

Inventors Mark V. Haley and Wayne G. Landis

Abstract The present invention is a process of degrading 1,4-dibenz-oxazepine with a microorganism enzymatically capable of converting the 1,4-dibenz-oxazepine into at least o-nitrophenol which is further converted to catechol. The present invention is preferably carried out using a strain of alcaligenes dentrificans. Dentrificans include: o-nitrophenol, catechol, and
3-methylcatechol.

Patent Number	4965202	Date of Issue	10/23/90
Application Number	429299	Date Filed	10/27/89

Composition of Biologically Pure Cultures of Alcaligenes Dentrificans and a Porous Carrier Useful for Biodegradation

Inventors Mark V. Haley and Wayne G. Landis

Abstract The present invention is a process of degrading 1,4-dibenz-oxazepine with a microorganism enzymatically capable of converting the 1,4-dibenz-oxazepine into at least o-nitrophenol which is further converted to catechol. The present invention is preferable carried out using a strain of alcaligenes dentrificans. Dentrificans include: o-nitrophenol, catechol, and 3-methylcatechol.

Patent Number	5169777	Date of Issue	12/08/92
Application Number	573970	Date Filed	08/27/90

Emulsifier Mixing Cell

Inventors Donald E. Roop, David L. Bachman, Eugene J. Mezey and Philip W. Bartram

Abstract A device for the continuous production or the production on demand of a water-in-oil emulsion from a water soluble chemical and an oil when mixed with an emulsifier. The device operates at relatively low pressures on the water and the oil lines. Water based

chemical and the oil are each introduced into the cell through spray nozzles. The nozzles are positioned so as to cause the two sprays to intermix just prior to impinging on the wall of the cell. The action of the sprays and the force of impinging on the wall produces shearing action in the chemicals that helps in producing an emulsion. A long tube extends from the cylindrical cell. This tube contains a passive mixing element which causes the mixed chemicals to be further mixed and to undergo additional shearing action. The effect of the tube is to assure that the chemicals are held in a mixed state long enough for a stable emulsion to be formed.

Patent Number	5011293	Date of Issue	04/30/91
Application Number	420810	Date Filed	10/12/89

Jet Engine Decontamination System

Inventor William M. Salyer

Abstract Decontaminating an object such as a vehicle, is achieved by subjecting the object to an elevated temperature for a time sufficient to achieve the desired temperature. The heat source is preferably a jet engine which is supported for universal movement. The temperature of the surface of the object under treatment is determined by sensing the infrared radiation emanating from the surface of the object. In response to the attainment of a predetermined level of infrared radiation, an electric control member is used to regulate the movement of said heat source. Thus heating is caused to be directed at selected regions of the object under treatment for the time period necessary to attain the desired temperature level.

Patent Number	4551092	Date of Issue	11/05/85
Application Number	550855	Date Filed	11/14/83

Method of Chemical Decontamination

Inventors Philip W. Bartram, Noel C. Dibona, James H. Buchanan and Dennis K. Rohrbaugh

Abstract An absorption process of using polydivinylbenzene to remove nerve agents such as GD from a conventional solvent such as chlorofluorocarbon which itself is used to decontaminate a surface such as armament.

Patent Number	5116512	Date of Issue	05/26/92
Application Number	718320	Date Filed	06/17/91

Method of Chemical Decontamination

Inventors Philip W. Bartram, Noel C. Dibona, James H. Buchanan and Dennis K. Rohrbaugh

Abstract An improved method of decontaminating a solvent which contains mustard. The improvement consists essentially of using polydivinylbenzene to absorb the said mustard.

Patent Number 5143621 Date of Issue 09/01/92
Application Number 718319 Date Filed 06/17/91

Powered Scrub Brush

Inventors James F. Mank, Michael D. Milosh and Timothy J. Carpenter

Abstract A powered scrub brush having a power head module, a brush head module, and an extension shaft module. The power head module includes a positive-displacement motor and a flow-control valve. The motor may be coupled directly to the brush head module or indirectly through one or more extension shaft modules. The power head module has a liquid discharge port that is connected to a liquid discharge tube on the extension shaft module that in turn is connected to a liquid sprayer having a nozzle on the brush head module. Mechanical power is transferred from the motor to the brush via an output shaft on the motor, a flexible shaft in the extension shaft module, and a shaft in the brush head module on which the brush is removably mounted. The powered scrub is manually operated by regulating a flow control valve that is connected between a pressurized water source and in inlet port on the motor. As pressurized liquid flows through the motor, the brush will rotate and liquid will be discharged via the nozzle. In an alternate embodiment, the brush is eccentrically mounted for orbital motion. In this version, a counterweight provides dynamic balance.

Patent Number 5146642 Date of Issue 09/15/92
Application Number 706487 Date Filed 05/28/91

Process for Preparing Chlorinated Lime

Inventors Russell K. Smith, Edward R. Zanejc, and James F. Miller

Abstract A process for preparing chlorinated lime solid having an available chlorine content in the range of about 30 to about 50 weight percent by contacting a chlorine source, e.g., liquid chlorine, with a basic calcium-containing substance, e.g., hydrated lime, in the presence of water or aqueous calcium chlorine at a pH to produce an aqueous slurry having

available chlorine con-tent in the range of about 13 to 17 weight percent and a pH in the range of about 10.6 to 10.9 and containing an aqueous solution and a chlorinated lime precipitate having less than about 40 to 50 percent water combined with drying said chlorinated lime precipitate to produce chlorinated lime solid having the desired available chlorine content is disclosed.

Patent Number	4849201	Date of Issue	07/18/89
Application Number	241998	Date Filed	09/02/88

VX Adsorption from a Chlorofluorocarbon Solvent Using a Macro-reticular Strong Acid Resin

Inventors Philip W. Bartram, Noel C. Dibona, James H. Buchanan, and Dennis K. Rohrbaugh

Abstract A polydivinylbenzene macroreticular strong acid resin can effectively decontaminate solutions containing organophosphorus chemical warfare agents such as o-ethyl s-(2-diisopropylaminoethyl) methylphosphonothiolate (VX).

Patent Number	5069797	Date of Issue	12/03/91
Application Number	637028	Date Filed	01/03/91

Smoke and Obscuration

Particulate Obscurant Disseminator Air Source

Inventors D. Jeffrey Hale, William A. Adams

Abstract A particulate obscurant disseminator couples the shaft power of the host vehicle through a clutch and fluid coupling to a high ratio gear box whose output shaft drives a compressor of an automative-type turbo charge whose air output is fed to the input of a venturi type ejector where additional air flow is induced and mixed with particulate from a bin supply to from an obscurant cloud.

Patent Number 5255125 Date of Issue 10/19/93
Application Number 997009 Date Filed 12/28/92

Millimeter Wave Screening Cloud

Inventors William G. Rouse, Connie S. Kilgore, Ronald E. Rhea, Michael J. Burnham, Benjamin G. Wachob

Abstract A millimeter wave screening cloud is formed comprised of an aerosol of fine fibers of a carbon composition, in which the particles are of micron diameter and millimeter length. The cloud is formed by aerosolizing a compact mass of carbon composition fibers through the action of explosively bursting such compact mass in the atmosphere at the desired cloud location.

Patent Number 5148173 Date of Issue 09/15/92
Application Number 687113 Date Filed 04/15/91

Composition

Inventors Cecil D. Hassell, Lawrence A. Bickford, Sandra D. Smith, Gartung Cheng, and Gene V. Tracy

Abstract A mixture containing 3,3-bis(aziodomethyloxetane) and terephthalic acid for use as a white cloud producing composition which may be used by the military for screening field operations.

Patent Number 5098488 Date of Issue 03/24/92

Application Number 671605 Date Filed 03/19/91

Dispersible Smoke/Obscurant Forming Compositions

Inventors Raymond R. Fry, Jr., Werner W. Beyth and Merlin L. Erickson

Abstract A smoke forming composition is provided suitable for being explosively dispersed in projectile bombs, grenades and the like munitions which is composed of a mixture of finely divided solid particles of smoke forming material and a liquid component in an amount sufficient to densify the solid particles of smoke forming materials to increase the bulk density thereof as well as reducing the danger of ignition or "flashing" of the smoke forming materials when explosively dispersed.

Patent Number 5122298 Date of Issue 06/16/92
Application Number 642979 Date Filed 01/17/91

Method of Molding a Red Phosphorous Pyrotechnic Composition

Inventor Peter D. Mirabella

Abstract A method of molding a red phosphorous pyrotechnic mix containing an epoxy binder, which is markedly improved by the addition of silica.

Patent Number 4503004 Date of Issue 03/05/85
Application Number 588827 Date Filed 03/12/84

Stable Aqueous Foam Formulation, and Method of Use Thereof for Visual Obscuration and Area Denial

Inventors Harry A. Brown, Jr. and Robert F. Durgin

Abstract An improved, stable high expansion aqueous foam formulation of a single composite solution containing a relatively large amount of ammonia. A method of using the ammonia aqueous foam for visual obscuration and area denial is also disclosed.

Patent Number 4203974 Date of Issue 05/20/80
Application Number 886961 Date Filed 03/15/78

Munitions

Anti-Fouling Connector for Electronically Detonated Munitions

Inventors John P. Fiala and Irving F. Barditch

Abstract The present invention relates to an apparatus and method for clearing the fouling black powder residues deposited on the electrical connectors of electrically detonated munitions. A female connector is provided with a recurved lanced outer spring clip which automatically scrapes off the residue on an insulator and contact surfaces of a male bipolar connector plug when the two connectors are rotated with respect to each other.

Patent Number	5074215	Date of Issue	12/24/91
Application Number	551108	Date Filed	07/09/90

Azimuth Determination Method

Inventor Brian K. Bowers

Abstract A method for measuring the azimuth angles of grenade launcher tubes quickly and directly, uses an easily fabricated, portable fixture and a commercially available hand-held com-pass. There is not need for a precise set-up of complex equipment or mathematical computations.

Patent Number	5225626	Date of Issue	07/06/93
Application Number	906391	Date Filed	06/30/92

Composition for Use in Flares

Inventors Cecil D. Hassell, Lawrence A. Bickford, Sandra D. Smith and Gartung Cheng

Abstract A mixture containing 3,3-bis(aziodomethyloxetane) and strontium nitrate for use in flares.

Patent Number	5071497	Date of Issue	12/10/91
Application Number	671604	Date Filed	03/19/91

Delay Burster for a Projectile

Inventors Aaron S. Berlin, Vincent C. Little and Toney E. Leadore

Abstract A short delay burster for a canister ejecting projectile utilizes a multi-mesh screen operatively disposed in a choke configuration housing and held therein by an orificed retainer to permit the delay to be initiated by an expulsion charge while withstanding the high pressure shock wave of the expulsion charge explosion.

Patent Number 4221167 Date of Issue 09/09/80
Application Number 951550 Date Filed 10/16/78

Device for Launching Non-Lethal Ring Airfoil Projectiles

Inventors Roy D. Plumer and Donald N. Olson

Abstract A sabot launching device attachable to the muzzle of a standard rifle for launching a non-lethal ring airfoil projectile at a desired velocity and for imparting a desired rate of spin to the projectile, the invention comprises a housing having rifle grooves formed proximous to an open distal end thereof for imparting spin to the end of the housing. A sabot member engages the projectile within the housing prior to launch and is projected forwardly within the housing while in engagement with the projectile under pressure produced by firing of a gas-producing round in the standard rifle. The forward movement of the sabot member is rapidly slowed by a buffer mechanism disposed within anterior portions of the housing after initial acceleration to cause only the projectiles to exit and thus be launched from the housing and being reusable. The launching device is particularly useful for momentarily disabling disorderly persons without causing them serious injury, such as is necessary during civil disturbances and similar situations.

Patent Number 4270293 Date of Issue 06/02/81
Application Number 27438 Date Filed 04/05/79

Dye Marker Assembly for Rocket Practice Round

Inventors Leonard F. Burke and Arthur P. Dean

Abstract A rocket training round is disclosed to utilize a frangible nose cone containing dye marker material. Upon impact at a target the nose cone breaks thus releasing the dye marker which creates a dye cloud visible within a range of 3,000 meters.

Patent Number	4326463	Date of Issue	04/27/82
Application Number	153469	Date Filed	05/27/80

Method of Assembling Threaded Base to a Projectile

Inventors Bruce W. Jezek and Glen L. McClung

Abstract A torque adapter apparatus for threading an externally threaded base member having a smooth bore rear end to an internally threaded tubular projectile housing. The adapter utilizes a biased pegged locking plate member to initially retract a plurality of peripherally positioned friction clamming elements to permit insertion of the adapter within the base member rear end. Once the adapter is within the base of the base member the pegged locking plate biasedly cams a plurality of tape locking elements into a locked position permitting torquing of base member to the threaded projectile housing.

Patent Number	4258462	Date of Issue	03/31/81
Application Number	62610	Date Filed	08/01/79

Pre-Wrapped Two-Piece Ring Airfoil Projectile of Non-Hazardous Material

Inventor Donald N. Olson

Abstract The invention is a non-lethal projectile for use in riot control. The structure is an improvement over prior similar projectiles, in that the sealing of the riot control agent payload is enhanced, thereby preventing leakage and consequent rejection. The invention allows for the complete sealing of the payload cavity, before filling, and then the introduction of the payload by a hypodermic type needle to penetrate the sturdier rubber-like final closure cover which self-seals when the needle is withdrawn.

Patent Number	4262597	Date of Issue	04/21/81
Application Number	6326	Date Filed	01/25/79

Grenade Launching Apparatus

Inventors Paul G. Schabdach, Irving F. Barditch, William G. Rouse, John P. Fiala

Abstract A grenade launching apparatus launches a number of grenades and has a controller and a launcher. The controller controls the launching and includes a selector which

is responsive to operative input for selecting one or more of the grenades to be launched. The controller also includes a display for indicating that a selected grenade has been launched. The launcher is for launching one or more of the grenades and includes a firing circuit activates the launcher to launch each selected grenade. The launcher also includes a launch detector for detecting that a selected grenade has been launched by the firing circuit. The display of the controller is responsive to the launch detector.

Patent Number	5291680	Date of Issue	03/08/94
Application Number	943657	Date Filed	09/19/92

Projected Grenade Simulator

Inventors Irving F. Barditch and Paul G. Schabdach

Abstract A projected grenade simulator test circuit is used for checking the operability of a grenade launcher system by exactly duplicating both the physical and electrical characteristics of an actual grenade.

Patent Number	5050501	Date of Issue	09/24/91
Application Number	637911	Date Filed	01/07/91

Projectile

Inventor Abraham Flatau

Abstract A projectile is adapted to be launched from a barrel. The projectile includes a tubular housing and structural member. The tubular housing has a forward inlet throat and AFT nozzle. An annular layer of solid fuel combustible material is mounted within the housing between the inlet throat and nozzle. The structural member is detachably mounted over the nozzle. The structural member is sized to cover the nozzle so that pressurized gas applied to the structural member forwardly thrusts the housing. Thus, the projectile is unlaunchable and can produce a ramjet action.

Patent Number	4539911	Date of Issue	09/10/85
Application Number	335306	Date Filed	12/28/81

Shape Charge Agent Disposing Process

Inventors Robert E. Krauch, Jr. and Thomas W. Tranberd

Abstract A system method of disseminating lethal and nonlethal agent within a target to cause respiratory and ocular irritation to animals therein by the use of an agent carrying shaped charge munition. Agent is located in a disposer of special truncated cone shape. The disposer is located in the forward end of the projectile munition. As the projectile impacts and forces its way through a target wall, for example, the special shape of the disposer gives it temporary integrity to withstand external forces and contain this agent until target penetration is realized. The agent is loaded into the disposer and it is assembled to the munition.

Patent Number	4259906	Date of Issue	04/07/81
Application Number	3435	Date Filed	01/12/79

Supersonic, Low-Drag, Solid Fuel Ramjet Tubular Projectile

Inventors Donald N. Olson and Joseph Huerta

Abstract A low-drag supersonic tubular projectile with self-contained thrust augmentation and capable of simultaneous dual internal air flows. One is a centrally located supersonic flow for providing low-drag characteristics, and the other a subsonic flow path, comprising a ramjet structure with solid fuel for deriving thrust augmentation enabling the projectile to achieve a terminal velocity which is substantially the same as or exceeding muzzle velocity.

Patent Number	5067406	Date of Issue	11/26/91
Application Number	608915	Date Filed	11/05/90

Solid Fuel Ramjet Tubular Projectile

Inventors Joseph Huerta

Abstract A solid fuel ramjet tubular projectile has a generally tubular body fabricated of dense material or suitable hardened material having a bore formed therethrough and having first and second ends. A plurality of partitions divided the bore into a plurality of separate combustion chambers. Each of the combustion chambers extends longitudinally substantially the length of the body. Solid fuel is formed upon the body within each of the combustion cheers. An inlet is formed at the first end of the body, into which air is received.

Patent Number	5544586	Date of Issue	08/13/96
Application Number	300004	Date Filed	08/30/94

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Others

Methods and Apparatus for Suspending Microparticles

Inventors Stephen Arnold, Piers Hendrie, Burt V. Bronk

Abstract A device and method is described for joining two or more small particles to form a composite levitated particle. The size of the particles joined may be in the range 0.1 micrometer to 30 micrometers. The device utilizes a linear quadruple electrodynamic levitator with storage rings at right angles to the levitating electrodes. The storage rings move the charged particles to desired positions with DC electric fields. Particles with different sign but unequal charge are then joined by means of displacements caused by the DC fields of the storage rings. The initial particles and the final composite particles are retained free of any contact with substrate in the levitating fields of the linear levitator.

Patent Number	5532140	Date of Issue	07/02/96
Application Number	216863	Date Filed	05/23/94

Apparatus for Growing Microorganism Cultures

Inventors Irving F. Barditch, Maryalice Miller

Abstract Apparatus for growing cultures of microorganisms comprised of an inert rigid porous member having passageways extending therethrough and structure for bringing liquid in contact with one side of the member. In one species of the invention, the passageways are small enough to prevent microorganisms from flowing through them.

Patent Number	5523235	Date of Issue	06/04/96
Application Number	293282	Date Filed	08/19/94

Methyl Bis(trifluoromethylthio)arsine

Inventors Shekar Munavalli, David I. Rossman

Abstract Disclosed is an improved method of preparation of trifluoromethylthiocopper is a very highly purified state and its application to the synthesis of organic and inorganic compounds containing the trifuoromethylthio moiety. Biological testing has shown that dimethyl(trifluoromethylthio)arsine is one of the most potent lung irritants know.

Patent Number	5349076	Date of issue	09/20/94
Application Number	146722	Date Filed	09/17/93

Radiation Detectable Inflatable Decoy

Inventor James A. Genovese

Abstract A multi-dimensional decoy uses a non-combustible exterior to support a reactive interior metal film in the form of a rapidly inflatable balloon to generate an infrared and radar signature to match the thermal and radar profiles of an intended target.

Patent Number	5424741	Date of Issue	06/13/95
Application number	159608	Date Filed	12/01/93

4-[1-(1-Naphthalenyl)ethyl]-1H-Imidazole, Method of Making and Use as an Anesthetic

Inventors Fu-Lian Hsu and William P. Ashman

Abstract The chemical 4-[1(1-Naphthalenyl)ethyl)]-1H-imidazole and a method of making the same.

Patent Number	5151526	Date of Issue	09/29/92
Application Number	739650	Date Filed	04/02/91

Adsorber Switching Valve

Inventors Daniel C. Walter and Robert N. Schmidt

Abstract An apparatus for controlling the flow of fluid, comprising an eight-way switching valve for directing an inlet stream of air to one of multiple adsorber beds and then to the crew compartment of an air-tight vehicle while simultaneously directing an outlet stream of air to another adsorber bed and then to the atmosphere, whereby the inlet stream may be purified by adsorption on one bed while the other bed is regenerated. The fluid is directed by passageways in rotatable valve spools axially collinearly aligned, connected together so as to rotate simultaneously, and having ports aligned with openings in a sealed valve housing which communicate with inlet and outlet piping and absorber bed piping. Rotating the valve pool aligns various con-figurations of passageways and piping so as to direct the streams to different beds. The valve spools may be contained in separate housings

for safety, avoiding cross contamination during switching. Because all the valve spools are driven by a single drive shaft, all bed inlet and outlet lines are switched simultaneously, providing safe operation and decreasing control logic requirements as well as weight, power, and volume requirements.

Patent Number	5167254	Date of Issue	12/01/92
Application Number	690193	Date Field	04/23/91

Apparatus and Method for Determining Electrical Conductivity of Water Vapor

Inventors Hugh R. Carlon and Rex M. Pritt

Abstract An apparatus and method are disclosed for measuring the conductivity or number of water ion clusters present in a moist air environment. A test chamber is utilized for operatively simultaneously holding a "dummy" reference cell and a "large" conductivity cell having substantially the same leakage resistance. The cells are designed to have "cell factor" ratios substantially different from each other, A.D.C. power source with an in series vacuum-tube volt-meter is used to alternately measure the voltage drop of each cell under the similar variable ambient conditions. The conductivity or number of ion cluster present in the test environment is determined by a calculation using voltage compensated values and by graphical extrapolation.

Patent Number	4270084	Date of Issue	05/26/81
Application Number	55716	Date Filed	07/09/79

Blast Suppressive Shielding

Inventors Paul V. King, Albert P. Becher and Wilmer P. Henderson

Abstract Manufactures, apparatus and processes for shielding the hazards of explosives, pyrotechnics and propellants during manufacture, demolition, demilitarization storage, transportation and use.

Patent Number	4248342	Date of Issue	02/03/81
Application Number	78350	Date Filed	09/24/79

Blast Suppressive Shielding

Inventors Paul V. King, Albert P. Becher and Wilmer P. Henderson

Abstract Manufactures, apparatus and processes for shielding the hazards of explosives, pyrotechnics and propellants during manufacture, demolition, demilitarization storage, transportation and use.

Patent Number 4325309 Date of Issue 04/20/82
Application Number 75770 Date Filed 09/17/79

Blast Suppressive Shielding

Inventors Paul V. King, Albert F. Becher and Wilmer P. Henderson

Abstract Manufactures, apparatus and process for shielding the hazardous of explosives, pyrotechnics and propellants during manufacture, demolition, demilitarization, storage, transportation and use.

Patent Number 4326468 Date of Issue 04/27/82
Application Number 78349 Date Filed 09/24/79

Blast Suppressive Shielding

Inventors Paul V. King, Albert P. Becher and Wilmer P. Henderson

Abstract Manufactures, apparatus and processes for shielding the hazards of explosives, pyrotechnics and propellants during manufacture, demolition, demilitarization storage, transportation and use.

Patent Number 4347796 Date of Issue 09/07/82
Application Number 82263 Date Filed 10/05/79

Blast Suppressive Shielding

Inventors Paul V. King, Albert P. Becher and Wilmer P. Henderson

Abstract Manufactures, apparatus, and processes for shielding the hazards of explosives, pyrotechnics and propellants during manufacture, demolition, demilitarization, storage, transportation and use.

Patent Number	4389947	Date of Issue	06/28/83
Application Number	78348	Date Filed	09/24/79

Cell for Measuring Electrical Conductivity and IO Content of Vapor

Inventors Hugh R. Carlon and Rex M. Pritt

Abstract A vapor electrical conductivity cell with sensing plates mounted on insulators exposed to the vapor. Vapor condensation on those insulators cause errors in the conductivity measurements. The improvement of the invention keeps the insulators at a temperature higher than the vapor. The leakage errors are therefore reduced considerably.

Patent Number	5097212	Date of Issue	03/17/92
Application Number	637029	Date Filed	01/03/91

Compact High-Energy Auxiliary Power Method and Means

Inventors David B. Prier and Robert L. Dow

Abstract A low-cost, lightweight mobile gas turbine capable of rotating in excess of one hundred thousand RPM is coupled to a centrifugal air compressor which supplies high volume airflow to a diesel fueled combustion chamber for supplying hot gas to the turbine. Three energy outputs are obtained in the form of pressurized airflow, hot gas flow and large volumes of directed ambient air. The hardware components are essentially state-of-the-art, but their combination for use in multipurpose military combat operations has not heretofore been known. Such uses include smoke generation, dissemination of infra-red and radar absorbent clouds, decontamination of large masses, hot water supply and air pressure source for mechanics tool operation.

Patent Number	5115633	Date of Issue	05/26/92
Application Number	702298	Date Filed	12/06/84

Continuous-Flow Condensation Nuclei Counter and Process

Inventors Alvin N. Bird, Jr., Norman L. Francis and Albert L. Thomas, Jr.

Abstract A portable device and a process for detection of persons and things by the "condensation nuclei" technique. The disclosure sets out a new continuous flow device and process that collects an air sample, subjects it to supersaturation conditions when flowing for growing or condensation on air sample nuclei, and detects and counts the condensate or grown particles with a photo means and a conventional counter. An air sample is pumped through a heated tube humidifier where the sample becomes supersaturated for condensation. It is then carried by detector means for counting.

Patent Number	4293217	Date of Issue	10/06/81
Application Number	118946	Date Filed	02/06/80

Dehydrohalogenation Process

Inventors William R. Hydro and George T. Davis

Abstract Aliphatic and cycloaliphatic halogen compound containing a halogen atom and a hydrogen atom and adjacent carbon atoms are dehydrohalogenated by corresponding unsaturated compounds by a quaternary ammonium fluoride or quaternary phonium fluoride.

Patent Number	4449005	Date of Issue	05/15/84
Application Number	405680	Date Filed	08/06/82

Method and Apparatus for Protecting Crops from Frost by Jet-Dispersed Microencapsulated Aerosols

Inventors Hugh R. Carlon, Raymond R. Tytus and Arthur K. Stuempfle

Abstract The invention includes an apparatus for protecting plants from frost. A jet turbine engine has an input into which a first liquid and a second liquid are injected into the exhaust nozzle supplying an aerosol of the first liquid microencapsulated in the second liquid. The aerosol is dispersed about the plants to be protected from frost thereby to form a mist

which acts as a protective radiation barrier for the plants. The invention also includes a method for protecting plants from frost.

Patent Number	5052618	Date of Issue	10/01/91
Application Number	559114	Date Filed	07/26/90

Method of Screening Infra-Red Radiation

Inventor Roy E. Shaffer

Abstract A method of screening infra-red radiation is disclosed which comprises forming between the source of said radiation and the point of reception or detection an aerosol of finely divided, thin flat particles of aluminum which is highly reflective and opaque to said radiation, the dimensions of said particles being of the same order of magnitude as the wave-length of said radiation.

Patent Number	4484195	Date of Issue	11/20/84
Application Number	35380	Date Filed	06/10/60

Multipurpose Humidity Controlled Agent Generator

Inventors Kwok Y. Ong, Michael T. Packard and Charles J. McDowell

Abstract A test agent generator system capable of producing a controlled concentration of chemical agent vapors and aerosols under variable, controlled temperature and relative humidity conditions for use in a method of calibrating and testing agent sensitivity of a point source alarm system.

Patent Number	4269057	Date of Issue	05/26/81
Application Number	87892	Date Filed	10/24/79

Novel Microscope Slide Smoker

Inventor Robert A. Miller

Abstract A microscope slide smoker device for providing a layer of smoke reactant to a laboratory microscope slide comprising a base section having a flat upper surface with a rectangular aperture therein, fixture means mounted on rectangular aperture therein, fixture means mounted on said base at the shorter ends of said aperture for holding, aligning, and

smoking a microscope slide, slide rails mounted on the bottom of said base for receiving a burner screen holder and a hollow chimney tube section which is placed on the top surface of the base section.

Patent Number	4188908	Date of Issue	02/19/80
Application Number	3149	Date Filed	01/15/79

Process of Making Carfentanil and Related Analgesics

Inventors Louis P. Reiff and Paul B. Sollman

Abstract An improved process or method of synthesis of carfentanil and other potent analgesics of the n-alkyl 4-substituted 4-piperidinylamide class which can be used as morphine substitutes.

Patent Number	5106983	Date of Issue	04/21/92
Application Number	157012	Date Filed	04/30/90

Pump Speed Controller -- Nuclear Hardened/ Temperature Responsive

Inventors Paul G. Schabdach and Irving F. Barditch

Abstract An apparatus which serves to control automatically the speed of a pump according to the temperature of the oil being pumped from a reservoir. The controller is comprised of a parallel bank of thermal switches each connected to its dropping load resistor through a series isolation relay which places the load on a motor which drives the oil pump directly related to the viscosity of the oil in the reservoir.

Patent Number	5267835	Date of Issue	12/07/93
Application Number	889004	Date Filed	05/26/92

Remote Control Adaptor for a Detonator System

Inventor Paul G. Schabdach

Abstract A remote control adaptor for the XM-122 detonator system which utilizes a pair of color coded LED's to indicate the open or closed status of the output terminal of a bistable relay.

Patent Number	5546862	Date of Issue	08/20/96
Application Number	375336	Date Filed	01/19/95

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Most Recently Issued Patents

Hermetically Sealable Reusable Container

Inventor John L. McNerney

Abstract A device for housing toxic waste or toxic munitions including a vessel having a body flange and a removable cap that interfaces with the body flange to make a hermetic seal. A primary and a secondary O-ring are positioned between the cap and the body flange to ensure a leak-proof seal having an integrity of $1X10^{-6}$ He/sec at one atmosphere at standard temperature and pressure (STP).

Patent Number	5560511	Date of Issue	10/01/96
Application Number	370587	Date Filed	01/06/95

Focal Plane Filtered Multispectral Multidetector Imager

Inventor Mark L. G. Althouse

Abstract A dewar cooled piezo electric activated beam splitter permits a filtered two dimensional multispectral multidetector staring imager to operate as a target acquisition and recognition device as well as a detector and classifier of unknown chemical vapors or other targets with spectral fingerprint.

Patent Number	5568186	Date of Issue	10/22/96
Application Number	365374	Date Filed	12/27/94

Method for Testing the Toxicity of Chemicals Using Hyperactivated Spermatozoa

Inventor Ronald J. Young

Abstract A method is provided for the in vitro testing of chemicals to determine reproductive toxicity using hyperactivated rabbit spermatozoa, and a method is provided for the in vitro production of said rabbit spermatozoa of hyperactivated motility useful in said testing. Spermatozoa are incubated in a simple salts medium in air at 22° to 37° C. Hyperactivated motility develops in one-half to one hour. Motility parameter are then

measured using motion analysis systems and models for the classification of spermatozoa based on motility. Inhibition of hyperactivated motility of spermatozoa by exposure to chemicals may be used as an in vitro method of assessing the reproductive consequences of exposure of males to chemicals.

Patent Number	5569580	Date of Issue	10/29/96
Application Number	390454	Date Filed	02/13/95

Method for Determining Elongational Viscosity and Dynamic Surface Tension in Liquid Solution

Inventor Joseph E. Matta

Abstract Disclosed is a method for measuring intermolecular force related physical properties of an objective liquid such as elongational viscosity and dynamic surface tension, comprising the steps of atomizing neat liquids to a particle size in a gaseous fluid stream, measuring the particle size of the atomized neat liquid, determining an empirical expression based on known physical properties of the neat liquid and the atomization conditions, and using the empirical expression and identical atomization conditions to rapidly determine the unknown intermolecular force related physical properties of the objective liquid, the objective liquid being another neat liquid or a liquid in which a solute is dissolved.

Patent Number	5559284	Date of issue	09/24/96
Application Number	422966	Date Filed	04/17/95

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